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(71)Applicant : NIPPON PETROCHEMICALS CO LTD
(72)Inventor : TAKASHIMA TSUTOMU
INOUE TOSHIO

(54) POLYESTER RESIN COMPOSITION

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a polyester composition having an improved hydrolytic resistance (thermal aging resistance) and stretch characteristics without causing an large increase in the melt viscosity.
SOLUTION: The polyester resin composition is obtained by kneading 90-99.9 wt.% of a thermoplastic polyester resin and 0.1-10 wt.% of a liquid polybutene having an epoxy group at its terminal in a molten state to introduce a polybuthylene chain into the polyester simultaneously with blocking the terminal carboxy group of the polyester.

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(71)Applicant : NIPPON PETROCHEMICALS CO LTD
(72)Inventor : TAKASHIMA TSUTOMU
INOUE TOSHIO

(54) POLYESTER RESIN COMPOSITION REINFORCED WITH INORGANIC FILLER

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a polyester resin composition reinforced with an inorganic filler and having excellent strength and hydrolysis resistance.
SOLUTION: This polyester resin composition reinforced with the inorganic filler is produced by melting and kneading 95-55 pts.wt. of a thermoplastic polyester resin, 5-45 pts.wt. of an inorganic filler (the sum of the resin and the filler is 100 pts.wt.) and 0.1-5 pts.wt. of a liquid polybutene having an epoxy group on the terminal.

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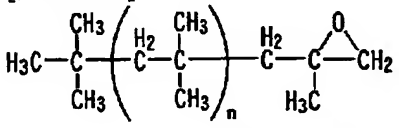
CLAIMS

[Claim(s)]
[Claim 1] The polyester resin constituent obtained by carrying out melting kneading of the 0.1 - 10 % of the weight (both being made into 100 % of the weight in all.) of the liquefied polybutenes which have an epoxy group at 90 - 99.9 % of the weight of thermoplastic polyester, and the end.
[Claim 2] The polyester resin constituent according to claim 1 characterized by more than 80 mol % in the liquefied polybutene which has an epoxy group at the end being what has the structure of a formula (1).
[Formula 1]



式(1)

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[Claim 3] A polyester system resin constituent given in either claim 1 characterized by obtaining the liquefied polybutene which has an epoxy group at the end from the liquefied polybutene of number average molecular weight 200-10,000, or claim 2.
[Claim 4] A polyester system resin constituent given in either claim 1 characterized by obtaining the liquefied polybutene which has an epoxy group at the end from the liquefied polybutene of number average molecular weight 250-3,500, or claim 2.
[Claim 5] The polyester resin Plastic solid which is a Plastic solid acquired from a polyester system resin constituent according to claim 1 to 4, and is characterized by passing through an extension process.
[Claim 6] The monofilament obtained from a polyester resin constituent according to claim 1 to 4.
[Claim 7] Industrial use textiles characterized by using for some of woof and/or warp [at least] the monofilament obtained from a polyester resin constituent according to claim 1 to 4.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the polyester resin constituent suitable for shaping which needs the grant on the strength by drawing processes, such as the polyester resin constituent with which hydrolysis-proof nature (heat-resistant aging nature) and melt viscosity stability were improved especially a monofilament, fiber, a sheet, a film, and a hollow container.
[0002]
[Description of the Prior Art] After the polyester resin which makes polyethylene terephthalate representation adds the inorganic filler aiming at rigidity and heat-resistant amelioration if needed as mold goods to which reinforcement was added by drawing processes, such as a monofilament, fiber, a film, and a hollow container, it is used as mold goods of an arbitration configuration by injection molding. Although a polyester resin product has the mechanical property excellent in the general target, under an elevated temperature and a humid environment, the property falls by hydrolysis and it has the fault of a hue also getting worse.
[0003] Especially the inclination was remarkable in industrial use textiles, such as ** for the textiles which used the polyester monofilament and the polyester monofilament for some of woof and/or warp [at least], for example, paper-making dryer canvas, a paper-making wire, a filter, a conveyor belt, and screens.
[0004] Existence of the end carboxyl group of polyester intramolecular is pointed out as a factor which promotes this hydrolysis, and the technique of carrying out chemical modification of the carboxyl group concerned, and raising hydrolysis-proof nature is proposed.
[0005] The typical amelioration approach of hydrolysis-proof nature is an approach to which a carbodiimide system compound or the poly carbodiimide compound, and an end carboxyl group are made to react. For example, a chain is made to construct a bridge and the technique of raising molecular weight is indicated by JP,10-168655,A and JP,10-168661,A at the same time the poly carbodiimide compound blocks the end carboxyl group of polyester. However, there is a problem of toxicity, a price, and a hue in a carbodiimide system compound. As other approaches, the approach to which an epoxy group content compound and an end carboxyl group are made to react is indicated. However, the well-known approach using an epoxy group content compound has the problem about the effect on the earliness of a reaction, and other properties.
[0006] Although refining by 1 which has a polyester mold block copolymer and polyether structure, and 2 organic-functions epoxy compound is indicated by JP,3-77826,B, when there is a heat-resistant problem in the constituent obtained and the amount component of macromolecules arises with the epoxy compound of two or more organic functions, a melting property serves as instability extremely.
[0007] Refining by the reaction of a polyester elastomer and various epoxy denaturation polymers is indicated by JP,10-245475,A. However, the thing illustrated as an epoxy denaturation polymer The polymers which have carbon and a carbon double bond, and these partial hydrogenation polymers A hydrogen peroxide, The polymer which carried out epoxidation by processing with a peracetic acid or other peroxy acids, Although it is a glycidyl (meta) chestnut rate, ethylene, styrene, etc. the copolymerized polymer, the polymer which used the radical initiator or the activity energy line, and copolymerized [which copolymerized and graft-denaturalized] the above-mentioned glycidyl (meta) chestnut rate monomer in the polymer principal chain If these are used, the melt viscosity of a constituent will increase substantially, or there are problems, like the heat deterioration and oxidation degradation of the carbon and the carbon double bond part in the polymer for refining which remains arise.
[0008] As a thing about the industrial use textiles using the polyester monofilament excellent in hydrolysis-proof nature, and its polyester monofilament, although there is patent No. 3247790 Manufacture of the diepoxy compound which makes a subject the para-hydroxybenzoic-acid diglycidyl ester ether to be used is not [making the carbodiimide compound indispensable,] easy, This epoxy compound is the straight chain structure of having ether linkage, and since the amelioration effectiveness of melting tension being small and the amorphous structure section do not exist substantially, problems, such as taking, are in the heat joining property of the woof and warp in industrial use textiles.
[0009]
[Problem(s) to be Solved by the Invention] The ingredient suitable for refining which can discover sufficient refining effectiveness even if this invention can raise the effectiveness which participates in polyester directly in view of an above-mentioned situation and its addition is little is offered, And the constituent obtained, maintaining many properties, such as thermal resistance, the transparency, etc. of a polyester body The suitable increment in melt

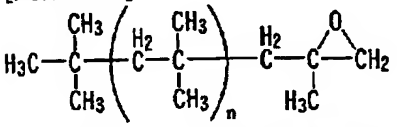
viscosity and melting tension is made, and it aims at offering the polyester resin constituent excellent in the on-the-strength addition nature and heat joining nature to a product by drawing, a polyester monofilament, and industrial use textiles.

[0010]

[Means for Solving the Problem] It is related with the polyester resin constituent obtained by carrying out melting kneading of the mixture which contains in the 90 - 99.9 % of the weight of the 1st polyester of this invention, and an end 0.1 - 10 % of the weight (both are made into 100 % of the weight in all.) of liquefied polybutenes which have an epoxy group.

[0011] It is related with the polyester resin constituent characterized by being that in which more than 80 mol % in the liquefied polybutene which has an epoxy group at the end has the structure of a formula (I) in the 1st [of this invention] of the 2nd this invention.

[Formula 2]



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[0012] It is related with the polyester system resin constituent with which liquefied polybutene which has an epoxy group at the end in the 1st [of this invention] of the 3rd this invention or the 2nd is characterized by being obtained from the liquefied polybutene of number average molecular weight 200-10,000.

[0013] It is related with the polyester system resin constituent with which liquefied polybutene which has an epoxy group at the end in the 1st [of this invention] of the 4th this invention or the 2nd is characterized by being obtained from the liquefied polybutene of number average molecular weight 250-3,500.

[0014] It is related with the polyester resin Plastic solid characterized by passing through the drawing process which comes to be the Plastic solid acquired from the polyester system resin constituent of the 1-4th either of the 5th this invention of this invention.

[0015] It is related with the monofilament obtained from the polyester resin constituent of the 1-4th either of the 6th this invention of this invention.

[0016] It is related with the industrial use textiles characterized by using for some of woof and/or warp [at least] the monofilament obtained from the polyester resin constituent of the 1-4th either of the 7th this invention of this invention.

[0017]

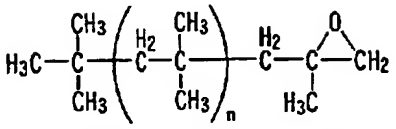
[Embodiment of the Invention] Although there will be especially no limit if the polyester concerning <polyester> this invention is thermoplastic polyester, polyethylene terephthalate (PET), polybutylene terephthalate (PBT), polyethylenenaphthalate (PEN), Polly 1, 4-cyclohexane dimethylene terephthalate (PCT), the thermoplastic polyester elastomer that makes these a hard segment and uses a polyether, amorphous polyester, etc. as a soft segment, half-aromatic series liquid crystal polyester, and all aromatic series liquid crystal polyester are included preferably. That effectiveness is most acquired in these are crystalline polyester (PET, PBT, PCT, etc.) which makes a terephthalic acid and diol the main repeat unit. Especially a desirable thing is a thermoplastic polyester elastomer which makes PET and PBT, and these a hard segment, and uses a polyether, amorphous polyester, etc. as a soft segment from a viewpoint which avoids that melting kneading temperature becomes an elevated temperature too much, and since the manifestation of the drawing effectiveness is large, its PET is desirable.

[0018] By the well-known approach, the liquefied polybutene (henceforth "epoxy group content liquefied polybutene") which has an epoxy group at the end of a <epoxy group content liquefied polybutene> chain can carry out epoxidation of the end carbon and the carbon double bond in the chain of liquefied polybutene, and can obtain it. The liquefied polybutenes of a raw material are C4 fraction from FCC in petroleum refining, C4 fraction produced in disassembly of the hydrocarbon of naphtha and others, carry out the polymerization of an isobutylene, butene-1, the thing containing the butane other than a butene -2, or the thing that added the isobutylene etc. to C4 fraction and adjusted the presentation to it by Friedel-Crafts catalysts, such as an aluminum chloride and 3 boron fluoride, etc., and are obtained. The main configuration unit of liquefied polybutene originates in an isobutylene. Although carbon and a carbon double bond exist in the end of liquefied polybutene and the structure has a vinyl mold, a vinylidene mold, etc., for the object of this invention, a vinylidene mold is desirable. The manufacturing method of the liquefied polybutene which has such an end vinylidene radical is indicated by JP,10-306128,A etc.

[0019] Epoxy group content liquefied polybutene can be obtained by the well-known approach. For example, the method of a peracetic acid and sodium acetate being dropped and manufacturing epoxy group content liquefied polybutene is shown in JP,51-8966,B, stirring liquefied polybutene and n-hexane. Although the same approach is indicated by the Europe patent disclosure official report EP 045749, the U.S. Pat. No. 3,382,255 official report, etc., these approaches can also be used preferably.

[0020] In this invention, it is desirable that more than 80 mol % of epoxy group content liquefied polybutene is a bottom type (1).

[Formula 3]



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Since the epoxy group content liquefied polybutene of a formula (1) does not have the 3rd class carbon atom substantially, it is excellent in heat-resistant degradation nature and anti-oxidation degradation nature, is stable also in the melting working temperature of polyester, and excellent also in long term stability. in addition, the structure concerned — more than 80 mol % — the molecule with which the included epoxy group content liquefied polybutene has an end vinylidene radical — more than 80 mol % — the included liquefied polybutene — a raw material — then, it can obtain easily. Such liquefied polybutene is obtained by carrying out the polymerization of the C4 fraction containing the well-known approach indicated by JP,10-306128,A etc., for example, an isobutylene independent, and the butene-1 and butene-2 grade other than an isobutylene to the bottom of existence of a boron-trifluoride complex compound catalyst.

[0021] In this invention, it is desirable that epoxy group content liquefied polybutene is obtained from the liquefied polybutene of number average molecular weight 200-10,000 (number average molecular weight by GPC measurement (polystyrene reduced property)) within the limits. If melt viscosity amelioration of melting polyester is not enough in number average molecular weight being less than 200 and 10,000 is exceeded, the reactivity at the time of melting kneading will fall.

[0022] The number average molecular weight of liquefied polybutene considers as within the limits of 250-10,000 still more preferably. In within the limits of this, the reservation of the effectiveness of the on-the-strength addition nature to a product and heat joining nature by the drawing of polyester becomes easy. Furthermore, when reactivity is also taken into consideration, it considers as within the limits of 250-3,500, and is within the limits of 250-1,400 still more preferably.

[0023] In addition, inevitably, when the epoxy group content liquefied polybutene obtained from the liquefied polybutene of the number average molecular weight of the range concerned combines with polyester system resin through an epoxy group, the polybutene chain connected with the bond part concerned is very short, if it compares with a polyester chain. Therefore, with this structure, since it is hard to generate phase separation structure (sea island structure), it does not check the transparency of polyester system resin.

[0024] The epoxy group (oxirane radical) of the epoxy group content liquefied polybutene concerning this invention is arranged at the end. For this reason, compared with the epoxy group (oxirane radical) arranged in usual reactant oligomer or the long-chain structure of a reactive polymer compound, reactivity with the carboxyl group in polyester and/or a hydroxyl group is very high. Moreover, the structure of polyester and the molecule generated by the reaction of epoxy group content liquefied polybutene has the hydrocarbon oligomer or branching which has branching in the end of the polyester molecule of a basis, and is rich in it at flexibility compared with a polyester chain, and is rich in flexibility compared with a polyester chain, and turns into structure which the hydrocarbon high molecular compound which is very easy to produce an intermolecular interaction added. Consequently, the melt viscosity and melting tension of melting polyester increase. In addition, the degree of this increment can be adjusted with properties, such as molecular weight of polyester, and the end carboxy group equivalent, the molecular weight of epoxy group content liquefied polybutene, and an addition.

[0025] Since the epoxy group content liquefied polybutene combined with the end of a polyester chain functions as a soft segment introduced into polyester resin, stiffness is eased and, as for the industrial use textiles which used for some of woof and/or warp [at least] the monofilament obtained from the polyester concerned, the heat joining property between monofilaments is improved.

[0026] In this invention, epoxy group content liquefied polybutene is added 0.1 to 10% of the weight to 90 - 99.9 % of the weight of polyester system resin in a kneaded object, and melting kneading is carried out. If effectiveness is not fully acquired as it is less than 0.1 % of the weight, but it exceeds 10 % of the weight, unreacted epoxy group content liquefied polybutene will remain in the last constituent, and will produce problems, such as bleeding. When the number average molecular weight of epoxy group content liquefied polybutene is small, for avoiding that glue stock and the problem to attach arise, 5 or less % of the weight is desirable.

[0027] The epoxy group content liquefied polybutene concerning this invention can be applied to easy for front faces, such as polyester system resin before melting kneading initiation, and homogeneity by diluting with warming or other solvents remaining as it is or if needed, since it is a liquid, and mixing with polyester system resin etc. with stirring mixers, such as a Henschel mixer and a tumbler mixer. Consequently, supply to the kneading machine of the polyester concerned is stable. in addition, the douche close by epoxy group content liquefied PORIBU and the douche close with a pump — being certain — it may be and you may add before melting of polyester, or to the back using natural dropping from a vent-port etc.

[0028] In addition, in melting kneading, if a catalyst is used, the effectiveness of this invention can be heightened. What is necessary is just to use as a catalyst what is generally used as a reaction of epoxy. For example, they are the metal salts of the periodic-table-of-the-elements I-a group of an amine compound, phosphorus compounds, ten or more carbon atomic numbers monocarboxylic acid, or dicarboxylic acid, or an II-a group. They are especially desirable trivalent phosphorus compounds, such as tributyl phosphoretted hydrogen triphenylphosphines. These may use two or more kinds together.

[0029] moreover -- the case where carried out reduced pressure attraction with the vacuum pump etc. preferably the melting kneading in process of a kneading machine, and by preparing a clear aperture in a final process, and unreacted epoxy group content liquefied polybutene remains since, as for epoxy group content liquefied polybutene, it had volatility sufficient in the bottom of atmospheric pressure or reduced pressure in the melting kneading temperature of polyester -- these -- a part -- or all can be removed out of a system and it is effective in property stabilization of an end product.
[0030] thermoplastic polyester system resin and epoxy group content liquefied polybutene react easily especially more than the melting point of this polyester by being desirable temperature higher 5-100 degrees C than the melting point and desirable temperature high 10-60 degrees C, coming out, and carrying out melting kneading. Moreover, the thing for 20 seconds - 10 minutes to do for between melting kneading is 40 seconds - 3 minutes especially preferably desirable still more preferably for 30 seconds to 5 minutes that the kneading processing time should just select the conditions to which the reaction mentioned above is fully carried out. It produces decomposition or the anomalous reaction of thermoplastic polyester system resin and is not desirable, if kneading temperature and time amount do not fulfill these range, and a reaction will not fully advance but will exceed.
[0031] There is no limit in the device which carries out melting kneading in any way, and well-known devices, such as a Banbury mixer, a roll, a monopodium kneading extruder, and a biaxial kneading extruder, can be used for the melting kneading-machine machine and concrete target equipped with a heating facility. In addition, these devices did not necessarily need to be prepared into the device which manufactures a pellet, and could be prepared into monochrome or the multifilament manufacture machine, the container manufacture machine, the sheet manufacture machine, and the making machine of the arbitration of an injection molding machine this. The desirable method of acquiring the effectiveness of this invention is an approach of supplying one shaft or a biaxial extruder, carrying out melting kneading processing 1 minute or more preferably 30 seconds or more, and manufacturing a pellet, after mixing a predetermined component to homogeneity with a tumbler or a mixer like a Henschel mixer.
[0032] the polyester resin constituent of this invention -- an inorganic filler, for example, a calcium carbonate, titanium oxide, a feldspar system mineral, clay, white carbon, carbon black, a glass bead, etc. -- the time -- granular or the bulking agent of amorphism, kaolin clay, talc, etc. -- a time tabular bulking agent, a glass flake, a mica, graphite, etc. -- the time -- a scale-like bulking agent; glass fiber, a carbon fiber, wollastonite, potassium titanate, etc. -- the time -- a fibrous bulking agent -- it can add . Moreover, additives, such as an impact amelioration agent like other polymers, an antioxidant, a thermostabilizer, an ultraviolet ray absorbent, lubricant, a nucleating additive, a plasticizer, a release agent, a pigment, and various elastomers, may be added further if needed. Therefore, what was obtained by blending with the polyester resin constituent in this invention the liquefied polybutene which has an epoxy group at thermoplastic polyester and the end, and components other than these, and carrying out melting kneading is included.
[0033]
[Example] Hereafter, although this invention is further explained in full detail according to an example, this invention is not limited with this.
The mixture of a peracetic acid (40-% of the weight acetic-acid solution) and sodium acetate is dropped putting in and stirring liquefied polybutene and n-hexane in a cooling system, heating apparatus, and a reaction container with a dephlegmator according to the approach of a publication to JP,51-8966,B using trade name LV-50 (Mn=430, the Nippon Oil chemistry incorporated company make) as <manufacture of epoxy group content liquefied polybutene> (example 1 of manufacture) liquefied polybutene. Performed accommodation of a dropping rate and cooling, and it was made to react at 20-30 degrees C, and stirred after dropping termination, subsequently the product was underwater poured out except for n-hexane by vacuum distillation, evaporation clearance of the ether was carried out through washing by an ether extract, water, and sodium carbonate, and desiccation, and the mixture which contains the liquefied polybutene (it has the structure of a formula 1 and is n=4-8) which has an epoxy group at the end 15% of the weight was obtained. Hereafter, this is called "epoxy group content liquefied polybutene A."
(Example 2 of manufacture) the end vinylidene structure acquired by the manufacture approach of JP,10-306128,A -- 85-mol % -- the mixture which contains the liquefied polybutene which has an epoxy group at the end like the above-mentioned example 1 of manufacture 70% of the weight was manufactured using the polybutene (Mn=250) to contain. Hereafter, this is called "epoxy group content liquefied polybutene B."
(Example 3 of manufacture) the end vinylidene structure acquired by the manufacture approach of JP,10-306128,A -- 85-mol % -- the mixture which contains the liquefied polybutene (it has the structure of a formula 1 and is n=10-14) which has an epoxy group at the end like the above-mentioned example 1 of manufacture 70% of the weight was manufactured using the polybutene (Mn=800) to contain. Hereafter, this is called "epoxy group content liquefied polybutene C."
[0034] After drying the polyethylene terephthalate chip of <comparison of hydrolysis-proof nature under hot environments (heat-resistant aging nature)> (example 1) intrinsic viscosity 0.9, it put into the drum tumbler, and 5 weight sections addition of "the epoxy group content liquefied polybutene A" was carried out, and it mixed. It continued, and supplied to the hopper of the biaxial melting kneading machine of 46mm of diameters phi of a screw (ratio-of-length-to-diameter=36), melting kneading was carried out by barrel maximum-temperature 280 **, and it pelletized at the process which extrudes and carries out water cooling and which is omitted from a dice. Moreover, the open vent-port was prepared near the dice, the vacuum pump was operated, and volatile matter was removed. Moreover, it was 40 seconds when the time amount by which a charge pellet is conveyed by the screw from under a hopper, and is extruded from a dice was measured with the color pellet. Most discoloration was not observed,

although it continued, this pellet was put into the petri dish and it was left in 140-degree C reduction-gear oven for 24 hours.
[0035] (Example 2) After drying the polyethylene terephthalate chip of intrinsic viscosity 0.9, it put into the drum tumbler, and 2 weight sections addition of "the epoxy group content liquefied polybutene B" was carried out, and it mixed. It continued, and supplied to the hopper of the biaxial melting kneading machine of 46mm of diameters phi of a screw (ratio-of-length-to-diameter=36), melting kneading was carried out by barrel maximum-temperature 280 **, and it pelletized at the process which extrudes and carries out water cooling and which is omitted from a dice. Moreover, the open vent-port was prepared near the dice, the vacuum pump was operated, and volatile matter was removed. Moreover, it was 40 seconds when the time amount by which a charge pellet is conveyed by the screw from under a hopper, and is extruded from a dice was measured with the color pellet. Discoloration was not observed, although it continued, this pellet was put into the petri dish and it was left in 140-degree C reduction-gear oven for 24 hours.
[0036] (Example 3) After drying the polyethylene terephthalate chip of intrinsic viscosity 0.9, it put into the drum tumbler, and 4 weight sections addition of "the epoxy group content liquefied polybutene C" was carried out, and it mixed. It continued, and supplied to the hopper of the biaxial melting kneading machine of 46mm of diameters phi of a screw (ratio-of-length-to-diameter=36), melting kneading was carried out by barrel maximum-temperature 280 **, and it pelletized at the process which extrudes and carries out water cooling and which is omitted from a dice. Moreover, the open vent-port was prepared near the dice, the vacuum pump was operated, and volatile matter was removed. Moreover, it was 60 seconds when the time amount by which a charge pellet is conveyed by the screw from under a hopper, and is extruded from a dice was measured with the color pellet. Discoloration was not observed, although it continued, this pellet was put into the petri dish and it was left in 140-degree C reduction-gear oven for 24 hours.
[0037] (Example 1 of a comparison) The polyethylene terephthalate chip of intrinsic viscosity 0.9 was dried. It continued, and supplied to the hopper of the biaxial melting kneading machine of 46mm of diameters phi of a screw (ratio-of-length-to-diameter=36), melting kneading was carried out by barrel maximum-temperature 280 **, and it pelletized at the process which extrudes and carries out water cooling and which is omitted from a dice. Moreover, the open vent-port was prepared near the dice, the vacuum pump was operated, and volatile matter was removed. Moreover, it was 60 seconds when the time amount by which a charge pellet is conveyed by the screw from under a hopper, and is extruded from a dice was measured with the color pellet. It continued, and yellowing was observed, when this pellet was put into the petri dish and it was left in 140-degree C reduction-gear oven for 24 hours.
[0038] The motor load when making the amount of extrusion the same per [concerning the amount of extrusion and kneading in the example 1 of a comparison] unit time amount per [concerning kneading in the <comparison of drawing engine performance> example 3] unit time amount was measured, and it checked that melt viscosity lifting almost the same [each load] and steep had not arisen. It continued and asked for the maximum rolling-up rotational speed which is made to increase the rotational speed of the strand rolling-up roll of a pelletizer, and a strand piece does not produce in each condition. It of an example 3 was 120% of the example 1 of a comparison.
[0039] It turned out that it is an ingredient suitable for the mold goods which need grant on the strength the polyester resin constituent applied to this invention from the above result is not accompanied by steep melt viscosity lifting, but hydrolysis-proof nature (heat-resistant aging nature) and a drawing property are improved, and according to hydrolysis-proof and a drawing process especially.
[0040]
[Effect of the Invention] Since according to this invention a melting property can be improved for good productivity, without changing substantially and a drawing property is improved in the hydrolysis-proof nature of thermoplastic polyester system resin, the ingredient suitable for the mold goods which need the grant on the strength by hydrolysis-proof nature and the drawing process especially can be obtained.

[Translation done.]